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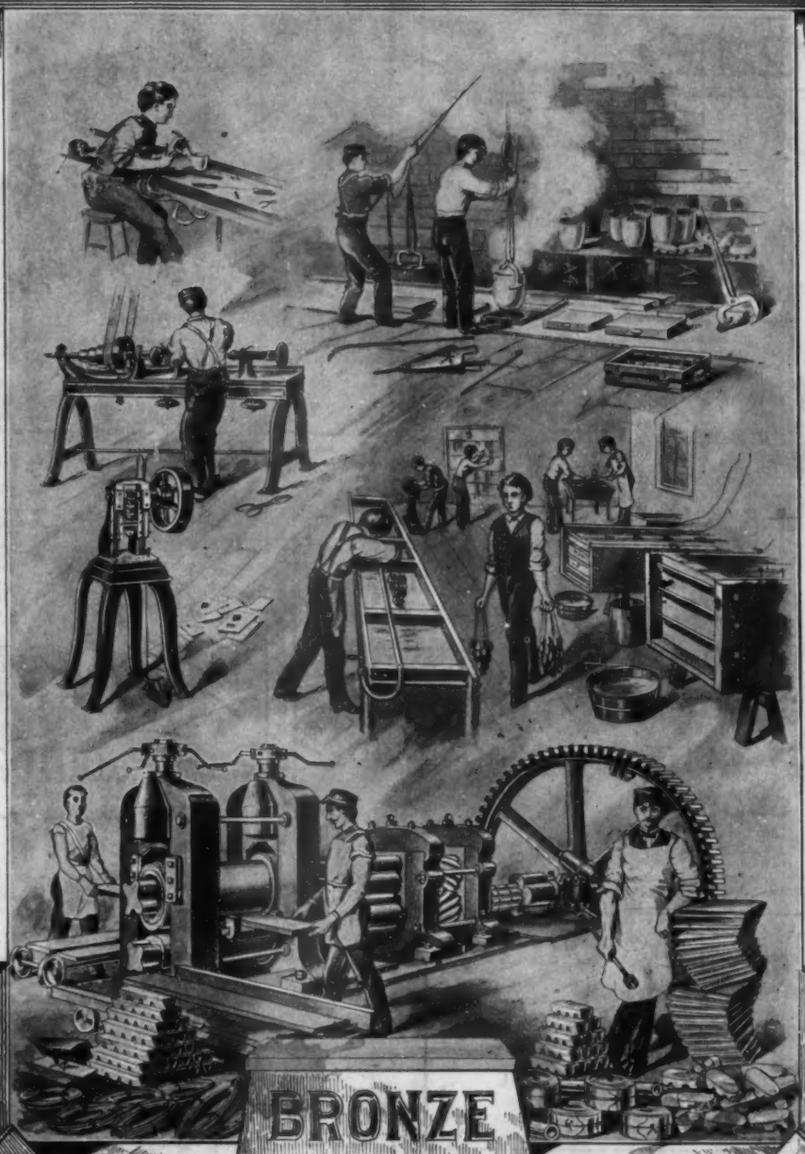

BRONZE

OLD SERIES
Vol. X. No. I.
Vol. II No. I.
NEW SERIES

LABOR OMNIA VINCIT

JAKUARY, 1904

NEW YORK.

61 BEEKMAN ST.

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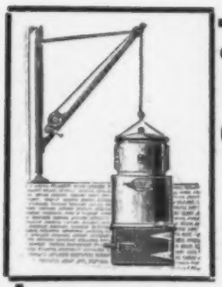

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WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, AND ELECTRO-PLATERS REVIEW.

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VOL. X., NO. 1.

NEW YORK, JANUARY, 1904

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THE METAL INDUSTRY
AND
THE ALUMINUM WORLD
AND
THE BRASS FOUNDER AND FINISHER
AND
ELECTRO PLATERS REVIEW

PUBLISHED MONTHLY BY

The Metal Industry Publishing Company

(Incorporated)

61 BEEKMAN STREET, NEW YORK

PALMER H. LANGDON, ... *Publisher*
ERWIN S. SPERRY, ... *Editor*
JOHN B. WOODWARD, ... *Director*

Subscription Price $1.00 per year, postpaid to any part of the world. Single copies, 10 cents.

ADVERTISING RATES ON APPLICATION.

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Entered February 10, 1903, at New York, N. Y., as Second Class Matter Under Act of Congress March 3, 1879.

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THE EAST AND THE WEST.

The present stagnation in the metal business has given rise, in certain sections of the East, to the opinion that the decline in the volume of orders is caused by the sharp competition of the Western mills. Such an idea appears to have produced much impression upon the uninitiated section of the public, and we feel disposed to explain the actual condition which now exists.

So far as the brass rolling mill industry is concerned, we believe that it is not far from the truth when we say that at least 90 per cent. of all the rolled brass, copper, German silver and allied metals and alloys is produced in New England. The balance is distributed partially over the middle West, and partially in New York, New Jersey, Pennsylvania and Maryland, so that it is doubtful whether more than 5 per cent. of the total output is produced in the West. If we assume that, during busy times, there is sufficient business to keep all the mills running full time (which there undoubtedly is) then it is scarcely possible that plants which are capable of producing only 5 per cent. of the output can absorb business to such an extent as to produce the conditions which now exist.

We must, however, bestow praise for the energy with which the Western mills are conducted, and the progress that they have made. As competitors they are strongly felt in the East, and are able to produce goods of the quality and cost of those of Eastern plants. The West is a rapidly growing country, and the consumption of brass and copper is constantly increasing. We believe, however, that there are sufficient mills in the West to satisfy the demands of the sheet, rod and tubing trade, and conditions scarcely warrant the existence of any additional ones. Were it not for the question of prices the competition of the Western mills would not be serious at all. We say this, for the large consumption of rolled metals is in the East. The cartridge mills, the clock manufacturers, the burner shops, the spoon and fork industries, the pin producers, and many other of the largest consumers now are situated in this section. It is on account of this fact that the Eastern mills have been able to increase in number and become as large and powerful as they now are. They are situated near their customers, and are, accordingly, able to keep in touch with their wants and cater to their peculiar needs, facts which render quite improbable the entrance of the Western mills into this Eastern cutting-up industry. The proper function of such mills appears to be to supply the needs of their own section, constantly growing in variety and volume.

The chief effect of the Western rolling mills on the trade is in the matter of prices. We have recently heard of orders being taken for brass sheet of thin gauges for one and one-quarter cents a pound above the cost of the mixture, but cannot say whether this price was quoted by an Eastern or Western mill. We do know, however, that the incentive for the quotation was stimulated by Western competition. Brass sheet cannot be produced for any such figure, and, coming as this has, the situation is quite interesting in the face of reports that the so-called Brass Trust is able to control prices for brass sheet. The statement is likewise made that this company is responsible for the present low prices and have brought about the present condition in order to prevent the entrance into the trade of other mills which would produce additional competition. Were the outside mills small and insignificant and did they lack sufficient capital to withstand a siege such tactics might avail something, but we doubt very much whether this company is sufficiently large and powerful to control prices. Although there are many large and powerful mills outside of this company, the balance of sheet production is largely in its favor, and since its formation there has been no betterment in the matter of prices. On the contrary, sheet brass prices have reached the lowest point ever known within the history of the industry. It is extremely doubtful, therefore, whether any of the mills, at the present prices of sheet brass, are able to show a profit. That which is now made is produced from copper, tubing, or specialties of some description, and not on the brass sheet itself.

In the sand casting industry, the influence of the West is far more powerful than that of the rolling mill. The western section of the country is filled with brass goods manufacturers, the majority of which are producers of plumbers' supplies, steam goods, and similar wares. We believe that more of these commodities are now actually produced in the West than in the East. If it does not already exist, such a state of affairs will certainly culminate in the future as the number of new brass foundries which manufacture these goods is increasing in greater proportion in the West than in the East. At present, Detroit is said to contain more brass foundries than any other city. The middle West appears to be the stamping ground for this class of wares, and well it may, for the consumption of such goods in that section fully warrants the magnitude of the industries. In the sand casting industry the West will certainly eclipse the East as the actual demand exists in that section itself.

In the manufacture of fine metal goods, silverware and art goods, together with the numberless kinds of brass goods, the East stands almost alone in the number and variety of the establishments where wares of this description are manufactured. The amount of such material that is produced in the West is comparatively so small that the competition is quite insignificant. It is in this line of industry that the Yankee appears to excel. Not in the design, for he seems to lack those requirements which are capable of linking together art and mechanics, but in the evolution of machines which make possible the cheap and rapid production of all classes of small metal wares. It is the Yankee who produced the present state of automatic machine working, and were it not for him we might yet be heading pins by hand, filing out the teeth of a clock wheel, or hammering up a silver spoon in the manner of the last century. It is he who has invented new methods of performing this work and brought about the foundation and growth of the mills among the hills of Connecticut, so that the East stands paramount in the "cutting-up" industry as it does in the manufacture of rolled metals. Whether this prestige will be wrested from it time alone will tell. It is dangerous to predict, as little is known of what the future will bring forth. It is unnecessary for the East to worry about the removal of this class of industries from Yankeeland, although many of our Eastern cities have considered the matter seriously; but if such a condition does come, as it already has in the cotton industry, it will probably be one of expansion rather than removal.

AMERICAN BRASS COMPANY, CHANGES.

The new year brings about several changes in the working arrangement of the American Brass Company of Waterbury, Conn. The Holmes, Booth & Haydens plant in Waterbury will be placed under the superintendency of Charles S. Morse, Esq., who will operate it in connection with that of the Benedict & Burnham Co., situated directly across the Naugatuck River. Mr. Morse has brought the latter plant to a standard of efficiency unsurpassed by any other brass rolling mill in the country, and he will certainly put the Holmes, Booth & Haydens mill on the same basis.

The casting for both plants will be done at the Benedict & Burnham mill, while the manufacture of brazed tubing will be carried on at Holmes, Booth & Haydens. It is rumored that the casting for The Waterbury Brass Co., also one of the American Brass Company's mills, will eventually be done at the Benedict & Burnham plant.

A RESEARCH LABORATORY FOR THE NAVY.

An expenditure of $400,000 has been authorized by Congress for the building of a laboratory for the navy department, to be used for research work. A similar laboratory is in operation by the German government, and excellent results have been obtained by it. A laboratory of this description has been under consideration for some time, and we believe that the idea is of comparatively long standing, but it is only recently that agitation has brought about the present culmination. Many problems are to be worked out, the majority of them of a mechanical nature, but, among other things, the corrosion of boiler and condenser tubes, and the relative value of various alloys for machinery, is to be investigated.

William H. Davol, senior member of the metal firm of John Davol & Sons, New York, died suddenly at his home in Brooklyn, N. Y., on December 15. He was the eldest son of John Davol, the founder of the firm, and had been prominent in the New York metal trade for more than a quarter of a century.

CASTING ALUMINUM BRONZE FOR ROLLING INTO SHEET.

BY ERWIN S. SPERRY.

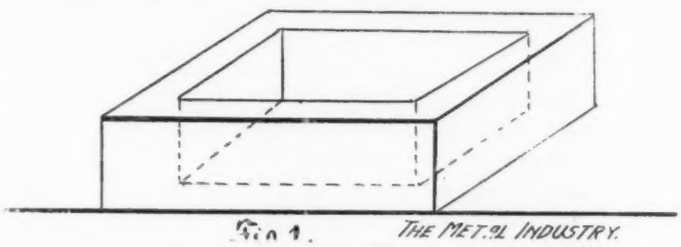
Those who have attempted to cast aluminum bronze for the purpose of rolling it into sheet will undoubtedly agree with me when I say that for an alloy of a refractory nature it easily surpasses every other known metallic substance. I know that this statement has been criticized and, undoubtedly it will be now, as among alloys which will roll at all German silver is generally supposed to be the most difficult to cast. It would be useless to attempt to convince any one who has not attempted to cast and roll aluminum bronze that my first statement is true, especially if a discouraging experience has been had with a bad lot of German silver, but after he has wrestled with the contortions which aluminum bronze is capable of assuming and suffered the exasperating consequences which results from endeavoring to roll an imperfect plate or cake, I know that he will believe German silver to be far in the background and, as a refractory substance, aluminum bronze to stand in a class by itself. Let it be understood, however, that the preceding remarks as well as the succeeding only apply to the casting of plates or cakes for rolling and in metal (chill molds). The casting of aluminum bronze in sand, although bearing the same relation in difficulty as it does in metal molds, forms a subject which must be treated by itself, as sand casting and casting plates for rolling are entirely different propositions, and for the skill required in producing, the latter greatly surpasses the former.

The reason that aluminum bronze proves so refractory in casting and rolling is on account of the fact that the film of oxide of aluminum always present on the surface of the molten metal cannot be reduced by oil or any other hydrocarbon in the same manner that the oxide film is reduced on brass, bronze, or German silver. No matter what the heat may be or the oil used, the film of oxide will still be present wherever any metal is exposed to the air and runs in with the molten aluminum bronze, producing a dirty, unsightly mess. The condition may be likened somewhat, though not to as great a degree, to that which exists when brass is cast without the use of any oil. The casting is dirty on the outside, and dross penetrates the interior in every direction. No amount of overhauling will remove these imperfections and the sheet produced is worthless. Were it possible to find any substance which would reduce oxide of aluminum as it is poured, then the usual method of brass casting could be followed. As it is, no such substance is known, and an entirely different method of casting must be followed.

The early attempts to cast rolling-mill plates of aluminum bronze were, of course, made in the usual brass mold, closed on all sides except the top and well coated with oil. When the results were seen it appeared evident that there was some trouble, as the plate was filled with dross to such a degree that the sheet made from it was worthless. Varying the temperature, the kind of oil, or the mixture only resulted in the same imperfect casting, and it became evident early in the history of attempts at rolling that some other method must be tried or no perfect metal would be obtained. In this connection it may be said that among those who first attempted to make aluminum bronze were the leading brass rolling mills, and even with the best brass casters that these establishments afforded the process of casting aluminum bronze in the usual brass mold resulted only in failure.

After this discouragement it was decided that the only method which could be used was the practice followed for casting copper or in an open mold. In this manner it was thought that the dross would float to the top and could be skimmed off. This was tried and, for sheet, was found to work fairly well; but even by this method only a very poor grade of sheet can be made. The early aluminum bronze product, however, was made in this manner, and although the uses of this alloy will always be somewhat limited, its true value was not appreciated for many years, as no good sheet could be turned out. This kind of open mold, while responsible for the majority of the ills, did not cause all, as will be explained later.

A cross-section of a copper cake mold is shown in Fig. 1. It is simply an iron casting open at the top into which the metal is poured. Copper is poured into the mold until full and allowed to cool. Aluminum bronze is treated in the same manner, except that the dross and other impurities which float to the top are skimmed off before the cake has cooled. Now herein lies the difficulty. Aluminum bronze in order to roll well must be poured at a very low temperature; in fact, it should be poured at the lowest possible temperature that it will run. If attention is not paid to this fact the cakes will crack in rolling. In the open mold this "dull" pouring may be readily carried out on account of the large volume of the basin, but when poured at the proper heat the dross is forced down under the surface of the metal and does not rise as it would were a high pouring heat used. When skimmed, the condition



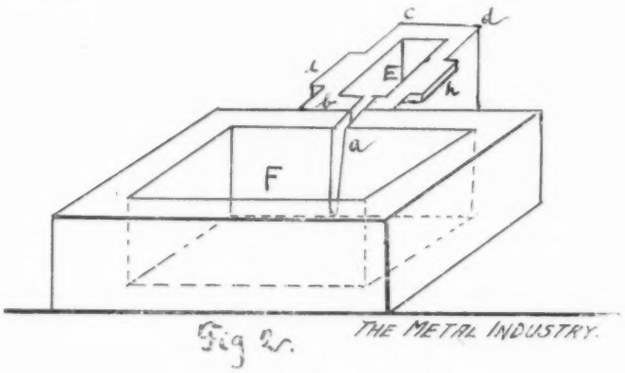
ORDINARY COPPER CAKE MOLD.

becomes still worse, as the dross which has actually floated to the top is only partially removed by the skimming, the balance is driven under the nearly solidified skin on the top of the cake. It was customary then, as it is now, to plane the top of the cake, but this operation does not remove the entangled dross of a cake cast in a plain open mold, and great patches of scale and slivers are found on the finished sheet. This casting operation then leaves much to be desired.

After a long unpleasant experience with this form of cake mold it occurred to me that possibly a slot cut in one side would hold back the dross and allow only clean metal to enter the mold. The ordinary cake mold was used and a slot planed in one end. An ordinary ingot mold with a slot also planed in one end was placed along side of the mold and the metal poured into this and allowed to run into the large mold. The first results in this direction were so encouraging that this plan of casting aluminum bronze rolling-mill cakes was adopted and used with excellent success.

Before going into the minute description of this method of casting, let me say that as far as my own experience is concerned it has been customary to roll aluminum bronze hot to about one-half inch in thickness ("broken-down hot") and to finish cold. This practice has given excellent results and is to be recommended. It may also be added that aluminum bronze is an ideal metal for hot rolling, as it does not appear to be red-short at any temperature below an actual melting, and there need not be as

much care exercised in heating or rolling this alloy as that required in manipulating Muntz metal, Tobin bronze or similar brass mixtures, which are red-short below a cherry red heat.



ALUMINUM BRONZE CAKE MOLD.

In Fig. 2 is shown the sketch for the mold which I have been accustomed to use for casting aluminum bronze. The mold itself, F, is the same as the usual copper cake mold. On one side a slot is cut, reaching down to the bottom of the mold. This slot is made tapering, so that the metal will readily free itself, and is generally made ½ in. at top

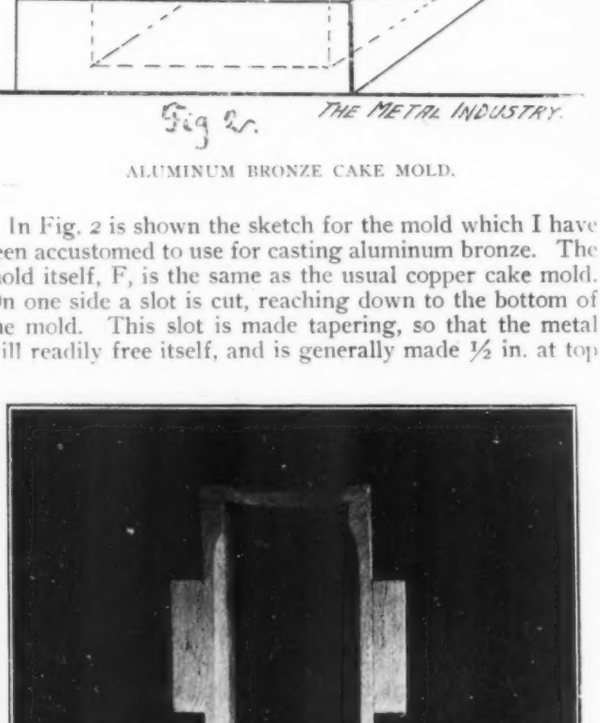


FIG. 3—MOLD FOR CASTING ALUMINUM BRONZE.

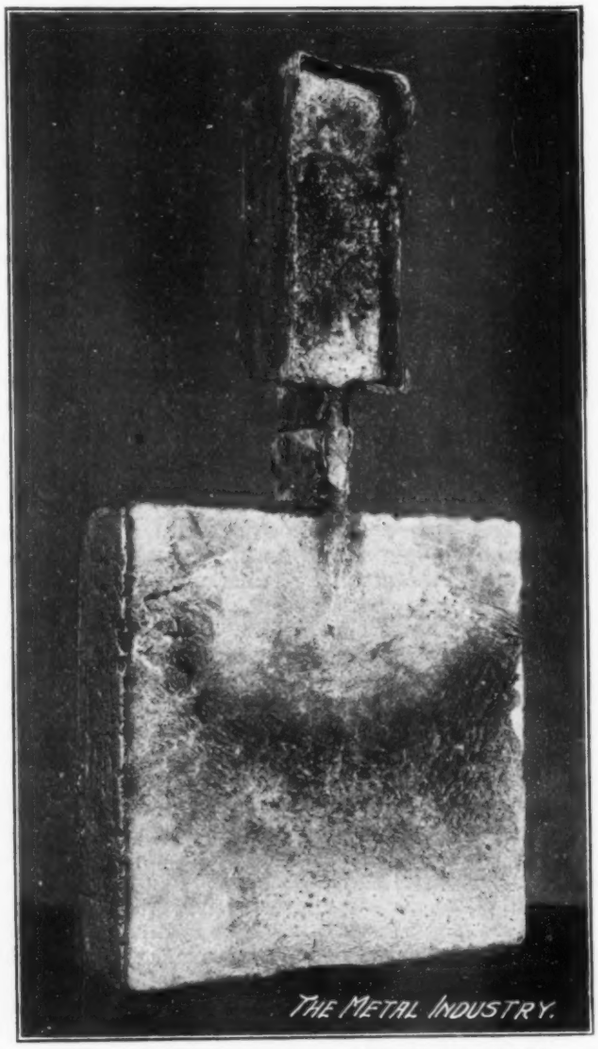
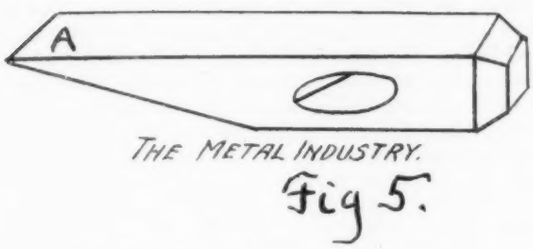


FIG. 4—ALUMINUM BRONZE ROLLING MILL CAKE

and tapers down to ¼ in. at the bottom. Another smaller mold, E, is made so that it fits closely against the side of the mold F. This small mold is similar to an ingot mold but of the full heighth of the other mold. Where the two molds touch it is better to plane the faces, as then the metal is not apt to run out between them. If this is done no clamps or bands are necessary, but the two molds are simply placed together. The wide surface prevents the metal from running out, as there is very little pressure. In using this mold the metal is poured into E, and it runs through the slot "a" into the mold F and gradually fills. When cool, the small mold is readily removed and the cake knocked out. Very little draught is needed, as aluminum bronze shrinks so much that it is easily removed. An almost rectangular cake may be obtained. It is well, however, to give plenty of draught to the slot and the small mold, as the removal of the cake is then greatly facilitated. In Fig. 3 is shown the mold itself, and in Fig. 4 that of an 8 per cent. aluminum bronze cake. After the cake has been removed the web is cut by means of a cold chisel at "a" and the cake left in a good condition.

I have found a handled cold chisel made after the sketch shown in Fig. 5 very useful for removing this web. The flat side A fits closely against the cake, and no fin or projection is left. Two men, one with a 16-lb. sledge and the other holding the chisel, can cut through this very rapidly, even with a few blows.



COLD CHISEL FOR CUTTING OFF GATE.

Reference to the cast plate in Fig. 4 will demonstrate that the majority of the dross remains in the small ingot. The slight amount on the top of the cake is only superficial, and there is none under the surface such as exists when cast in the ordinary way. If care is taken to pour carefully and at the proper heat a plate even cleaner than this may be obtained.

Although the form of the mold for casting aluminum bronze for rolling-mill plate is very fundamental, much attention must be paid to other details. Without such care the results will not be good. Let me describe the process from the beginning.

Aluminum bronze is simply an alloy of copper and aluminum with no other metals. All percentages will roll hot, but the limit of cold rolling seems to lie around that containing 91 per cent. of copper and 9 per cent. aluminum. This alloy (known as 9 per cent. aluminum bronze) is quite hard and rolls cold with some difficulty. The alloys up to 12 per cent. of aluminum, however, roll hot remarkably well as, paradoxical as it may seem, the hardest alloys cold are the softest when hot. The same thing is true of brass. Muntz metal is much softer when hot than even copper itself. Although any alloy of aluminum and copper up to 9 per cent. will roll hot and cold, there is at the present time but two alloys that are actually used for rolling into sheet. They are the 4 per cent. aluminum bronze, containing 96 per cent. copper and 4 per cent. aluminum, and the 8 per cent., containing 92 per cent. copper and 8 per cent. of aluminum. The 4 per cent. alloy is quite soft and very tough and may be used for all kinds of spun, drawn or stamped work. It has been used for the manufacture of flat ware on account of possessing a color nearly like that of 14-karat gold. In fact, the two placed side by side can scarcely be distinguished by any difference in tint. This 4 per cent. aluminum bronze is undoubtedly the nearest approach in color to a 14-karat gold of any known alloy. It is not very non-corrosive, however, and tarnishes readily. The alloy is exceptionally tough.

The 8 per cent. alloy is quite non-corrosive and very strong, but requires careful cold treatment, as it is hard when cold. The "pinches" in cold rolling must be light. This alloy, though, rolls hot with great ease, as it is quite soft when at a red heat.

To make aluminum bronze, use the best brands of copper and aluminum. Nothing is gained by using cheap metals for making this alloy any more than there is in making German silver. Lake copper is to be preferred, and aluminum containing at least 99 per cent. of pure metal. If possible to obtain a more pure grade it will be better still. Melt the copper in a plumbago crucible (which has never been used for other metals) under charcoal and common salt. Put a handful of salt in the crucible when the copper is put in and a couple of handfuls more after the copper is nearly melted, and stir it in well. Keep plenty of charcoal on the top of the melted metal. When the copper is all melted (the copper need not be very hot, nor is it advisable, as will be explained later) I myself have always found it expedient to remove the crucible from the fire before adding the aluminum. If there is considerable charcoal on top of the crucible, it may be carefully removed with a skimmer. Add the aluminum and stir with a *plumbago stirrer* (iron should not be used, as it is easily attacked). When stirred, the aluminum and copper will combine with great heat and the temperature of the mass often rises to whiteness. Inasmuch as there is a great disparity in the specific gravities of aluminum and copper, the mixture must be very thoroughly stirred, otherwise the aluminum will stay on top. After mixed it is well to add scrap to cool down the mixture to the proper pouring temperature. *Now pour into ingots and not into the cake to be rolled, as it has been found that aluminum alloys are better after once melted.* The scrap, if clean, is better than new metal.

To those who have an aversion to scrap this will seem ridiculous, but it is an actual fact verified again and again by experience. The best metal I have ever seen was made from scrap. Now re-melt the ingots and pour at the lowest possible temperature into the mold (directly into the small ingot). This point is likewise essential, for *hot-poured metal will not roll,* but will crack. This fact I have also verified, and it was only discovered by costly experience.

When I say *"poured cold,"* I do not mean to have it carried to extreme conditions, so that it will be pasty but the caster will soon learn the lowest possible temperature that he can cast it and have it run up well. This is the true casting temperature. The colder the pouring temperature the sounder the cake, provided the heat is high enough to allow the dross to float to the top.

After the gate has been cut off from the cake it has always been customary to plane the top and bottom of the cake until clean. A light cut cleans up the bottom, but a fairly heavy one is required for the top. An overhauling does not answer, as a deep cut is often required.

After planing, the cake may be rolled like copper, and if, after hot rolling, any cold rolling is required it is advisable to overhaul after the breaking down hot. In the manufacture of this alloy for the production of flat ware I have been accustomed to cast a cake 3 inches thick and 12 inches square; plane the top and bottom until clean, roll hot to ½ inch in thickness, overhaul, and then cold roll. By the use of this mold and following the above process I have been enabled to make over a mililon pounds of metal for flat ware and with practically no more bad metal returned from the spoon makers than is done with German silver.

There is one thing which I have neglected to mention. That is to *use no oil* of any kind on molds for aluminum bronze. It is not only unnecessary, but actually harmful, as it stirs up the metal and forms dross. A brass caster once informed me that if I could tell him what kind of oil to use on the molds for casting aluminum bronze that he could make good rolling-mill plates, as all kinds of oil seemed to give poor results. The secret of the oil question is to use no oil at all. No dressing is needed on the mold, as the aluminum bronze does not adhere to it.

The following points must be strictly adhered to if good aluminum bronze sheet is desired:

1. Use the best copper and aluminum.
2. Melt in crucibles.
3. Keep the copper well covered with charcoal.
4. Stir thoroughly after adding the aluminum.
5. Melt twice.
6. Skim well before pouring.
7. Pour at lowest possible heat.
8. Use no oil, grease or other mold dressing.
9. Plane the cakes.

10. Roll hot to one inch or thereabouts.
11. Overhaul before cold rolling.
12. "Weigh in" the amount of copper and aluminum wished in the alloy, as there is a very small waste in alloying.

GEORGE ALEXANDER DICK.

The recent death of George Alexander Dick at London, England, removes from our midst a man to whom we owe much for the improvement and working of the non-ferrous metals and alloys. For ability in this direction Mr. Dick was easily the peer of the late John Percy, and his scientific training and care with which problems were undertaken easily placed him in the front rank of metallurgists who have made the non-ferrous metals their study and work.

GEORGE ALEXANDER DICK.

George Alexander Dick was born sixty-six years ago in Offenbach-on-the-Main, Germany, but his father was of Scottish descent and his mother English. His father was the principal manufacturer in the town. After studying in Germany with the celebrated chemists, Fresenius, Bunsen, and Kirchof, Mr. Dick was appointed Professor of Chemistry at Antioch College, Ohio., U. S. A., but for some reason was prevented from accepting the position. He was afterward chemist to the Heinrichs-Hütte, a large iron works at Westphalia, Germany, and next blast furnace manager at the iron works at Bilbao, Spain (Hornos Altos Works). Owing to the unsettled political condition of Spain Mr. Dick removed to Paris and opened a general engineering office in connection with his brother, C. J. A. Dick, which business was successfully carried on until the breaking out of the Franco-Prussian war, in 1870, when he removed to England.

It was about this time that the use of phosphorus in tin bronze was tried by his friends Montfiori, Levi and Künzel, but their success was limited, and Mr. Dick probably was instrumental in bringing about the perfection of this alloy more than any other person. His results in this direction were so flattering that, with others, he formed in 1874 the Phosphor Bronze Company, of London, England, now a large and successful company. Mr. Dick managed this company until 1881. For the next few years Mr. Dick devoted himself to the improvement of the method of adding iron to the brass alloys. The fact that iron greatly increases the strength of brass was discovered before this time by Baron von Rosthorn, of Austria, but as he introduced the iron into the alloy in the shape of finely divided metal the result was very uncertain. Mr. Dick discovered that zinc could be made to absorb a large amount of iron and so could be introduced into the brass with certain results. The result was Delta metal, now a widely known and excellent alloy. It is simply brass with a small amount of iron introduced for the purpose of giving strength. The iron is introduced by means of zinc containing the maximum percentage of this element, and thus the uncertainty of the use of metallic iron introduced along with the copper is avoided. The Delta Metal Company was accordingly formed to market these ferrous alloys and of which Mr. Dick was managing director up to the time of his death. This company has for several years paid dividends equal to 12½ per cent., showing that the management was capable of making the enterprise pay as well as conducting the technical end.

In 1893 Mr. Dick took up the question of producing copper and brass rods by the extrusion process, or "squirting," as it is familiarly called. The principle of this process was not new, but had, up to this time, not yielded any satisfactory results. The process consists of extruding or "squirting" under hydraulic pressure metal in the plastic condition through an orifice of suitable cross-section. Heretofore rods of this kind could only be made by rolling or drawing, but by this process shapes thought impossible may be produced. Again very hard metals which cannot be manipulated cold may be extruded while in the heated and, consequently, plastic condition. This process, of course, is confined to those metals and alloys which may be worked hot (like copper or yellow metal), but there appears to be a limited field for the product. Mr. Dick, after many disappointments, succeeded in perfecting this process. The American Brass Company, of Waterbury, Conn., are the licensees for the United States, and are now making material by the process. The patents are owned by the Delta Metal Company, Limited, of London, England. Mr. Dick was also the inventor of a process for welding copper and its alloys, which are capable of being worked hot, details of which were published in THE METAL INDUSTRY (July, 1903). The American rights of this patent are likewise owned by the American Brass Company.

Although of an inventive turn of mind (and the patent reports bear witness of it), the ability of Mr. Dick appeared to lie in his being able to perfect inventions already cast aside as useless or beyond perfecting. His training was such that he was able to enter into matters of such a kind in a scientific manner. Mr. Dick appeared to combine a thorough scientific training with that of a successful business man, and his name will be handed down as one of the pioneers in non-ferrous metallurgy not only as an early worker, but one who was instrumental in placing it in the same category with other branches of technical science.

Thomas L. Luders, Sr., one of the founders of the Phosphor-Bronze Smelting Company, Limited, of Philadelphia, and for nearly thirty years treasurer of the company, died in Philadelphia November 23 in the eighty-second year of his age.

The metal trades lose an honored veteran in the death of Russell W. McKee, who for 42 years had been connected with the metal house of Bruce & Cook, New York City. Mr. McKee had been a partner of the firm since 1868.

AN INEXPENSIVE FRENCH-GRAY FINISH.

BY CHARLES H. POLAND.

The French-Gray finish has become so popular that any new method of producing it should be of interest to the electro-plating industry. The term *French-Gray,* covering as it does several modifications of the treatment of silver, has been limited in the strictest and, perhaps, really true sense to that finish produced by the use of platinum, and this method has already been described in THE METAL INDUSTRY, to which the reader is referred for the details of its formation. The use of platinum together with that of pumice stone produces very beautiful results, and the fact that such a finish may be applied without the aid of the electric current and also for the reason that the metal applied—platinum—is a noble one, renders such a method of producing the French-Gray finish quite attractive, and it is largely used.

With all due respect to the use of platinum for the production of the French-Gray finish, there are many instances where the goods will scarcely bear the expense of the platinum, even with the small amount that is used, and, indeed, I often hear of criticisms being made in regard to this finish on account of its being too dark in color. With these facts, especially that of cheapness, it is believed that the method which I am about to describe will meet with ready approval.

This modification of the *French-Gray Finish* is based upon the use of tin and is, in reality, only one of the deposition of pure tin on the silver in a finely divided condition. In fact, the tin deposit so produced is actually analagous to a coating of silver from a good cyanide bath, where the metal is in a finely crystalline condition and with the consequent matt surface. It is such matt or dead surfaces that render metal wares pleasing. Tin, being a white metal and practically inoxidizable at ordinary temperatures, readily lends itself for this operation, and the film so deposited upon the silver is actually more noncorrosive than the silver itself. It will readily be seen, therefore, why tin is well adapted for the purpose of producing an inexpensive French-Gray finish.

To produce this finish (and it may be well to say in advance that the most satisfactory and pleasing results are obtained on fancy patterns, where there is much relief work) the work is plated in the usual manner in a good cyanide bath and burnished, if desired. With cheap work, of course, the burnishing may be dispensed with and the work buffed, or, if desired, a bright silver plate may be produced by the use of bisulphide of carbon in the cyanide bath. With sterling silver the work should be buffed or burnished before commencing the operation of putting on the tin. All work must be freed from grease by putting through the potash bath, well rinsed in running water, then dipped in the cyanide dip. The work is then rinsed again and immediately transferred to the tin bath.

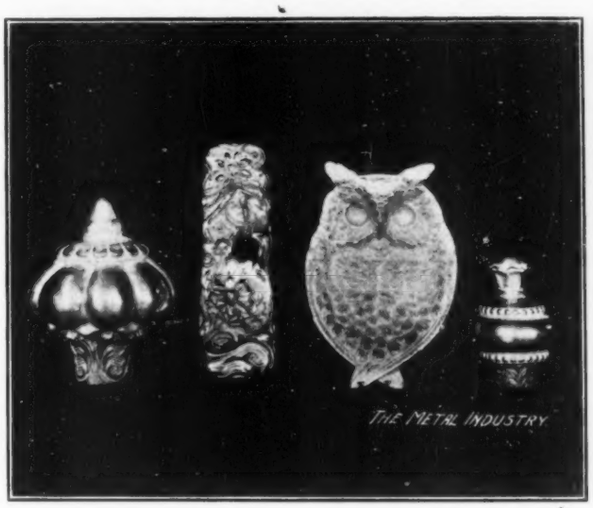
The tin bath is made as follows, viz:

Water	1 gallon.
Chloride of tin (muriate of tin)	2 ounces.
Sal ammoniac	1 pound.

Dissolve the chloride of tin in half of the water and the sal ammoniac in the remainder, and then mix the two. The solution is usually milky after this has been done, but the addition of a little sulphuric acid will clear it up. Add sufficient sulphuric acid to clear it up. The solution is run cold and an anode of pure block tin is used. Only a very light deposit is required, so that the operation need not take very long. A satisfactory deposit for ordinary work will usually be produced in about a minute. The length of time and strength of the solution will determine the shade of the deposit, and the operator will be obliged to determine these points to suit his own case.

In case the tin deposit on the work is not dark enough, then a small quantity of a strong solution of sulphate of iron (green vitriol) may be added, but must be used very cautiously, as too much will spoil the deposit. By careful manipulation of the sulphate of iron, however, any shade may be produced, and such changing conditions are often useful to suit individual cases. This, however, if left entirely to the taste of the operator, and if good judgment is used the results will be all that are desired.

After the desired color has been obtained the work is immediately removed from the bath and well rinsed in water; first in cold and then in hot, and lastly dried in sawdust. If the operation was well done, an even deposit of matt tin will be deposited evenly over the whole surface of the article, and to render it pleasing the high lights should be matted down with pumice and the hand or on a tampico wheel. If the tampico wheel is used the powdered pumice stone should have just enough water mixed with it to keep it from flying. Parts to be polished and those to remain matt are left to the individual taste of the operator, and no rule can be laid down for it. Very pleasing results may be obtained by first matting down the silver before it goes into the tin bath by means of pumice stone; then after treating with the potash dip, rinse water, cyanide dip any further rinsing, placing in the tin bath and giving a light coat. Then after removing, rinsing, and drying, matt down the high lights with pumice again. This is, in my own estimation, the most satisfactory way to produce a good French-Gray finish, even though platinum be employed to produce the gray. Such treatment avoids any polished surfaces and brings out the true color of silver better than any other way.



ARTICLES WITH FRENCH-GRAY FINISH.

In carrying out this process a strong current is necessary, as otherwise the solution does not cover well. As this process is really nothing more than a "strike," it is well to connect the work before putting in the bath. Only allow it to remain in the solution until the gray tint appears, as a thick coat does not adhere well and is also unnecessary. The best temperature for running is about 70 degrees Fahrenheit.

PICKLING CASTINGS FOR PLATING.

Castings which have been made in sand invariably have more or less of this substance adhering to them. In brass castings, and especially those containing aluminum, the amount of sand which adheres is quite small, but in some classes of castings, especially iron, the quantity is very large. Poorly made iron castings will often be completely covered with sand, and it is rare indeed that an iron casting is at all free from it.

The function of the tumbling barrel is to remove this sand, and for many purposes it suffices, but work which is to be plated must be pickled, as the tumbling barrel scarcely removes much beyond the exposed portions. Then, too, delicate work cannot be tumbled at all, as the abrasion and danger of breakage is too great. There is, of course, work which may be both tumbled and pickled with advantage, but there is no class of work intended for plating in which the pickling may be dispensed with. Such short cuts are often attempted, but with final regret on the part of the plater. Indeed, the success of plating iron castings depends upon the thoroughness of the pickling. Dipping will not remove the sand nor will any metal plate over it.

Sulphuric acid (oil of vitriol) was, for a long time, the "old standby," and for the iron itself is a good pickle, but is open to the objection that it only attacks the iron and does not act on the sand. Castings upon which such matter adheres are only attacked on the metal, and, in order to remove it, the acid must get down under and actually throw off the adhering mass of fluxed sand. It will readily be seen, then, that sulphuric acid, as a pickling solution, leaves much to be desired.

An acid which would attack the sand itself must answer the purpose far better than sulphuric acid, and such a liquid is found in *hydrofluoric acid* (not hydrochloric). It has been known for a long time that hydrofluoric acid attacks sand, and as a material for etching glass it has been, and is now extensively employed. As a material for pickling castings it is theoretically correct, and a practical experience of a number of years has proven it to be a valuable material for the purpose.

In using the acid, lead-lined tanks should be used, although wood painted with pitch or its equivalent may be employed, but lead is the best. The castings are pickled in the same manner that is carried out with sulphuric acid. Although many iron foundries use hydrofluoric acid for pickling and send the castings so pickled to their customers, it is almost imperative, if the best results are desired, for the plater to have his own acid and repickle them, as then a thorough job is done. No matter how well the foundryman does, there are always a few places which the acid has not removed and which would make trouble for the plater. If the plater does his own pickling he knows that he is doing a good job.

The use of hydrofluoric acid for pickling will insure all parts of the casting being acted upon alike (quite different from the tumbling barrel). The pockets and ridges, the grooves and the holes will come out equally clean with all other portions, and when plated there will be no places which refuse to take the metal. In conclusion it may be said that for pickling castings hydrofluoric acid has become a standard article.

The largest consumption of brass wire for any single article is in the manufacture of pins. The largest use of brass sheet is in cartridges. The largest consumption of brass rod is in the manufacture of screws, while more brass tubing is used in ships' condensers than in any other way.

CAUSTIC POTASH VS. CAUSTIC SODA.

Grease is the worst enemy of the plater, and it has been found that those who produce the best work are very careful in keeping the potash bath in proper condition and strength. It is, perhaps, unnecessary to dwell at length on the dangers of grease on work to be plated, as every plater knows that even the slightest touch with the hands imparts a film of grease on the article, invisible to the naked eye, but actually there to prevent the adherence of the plate to the base metal.

The potash dip is undoubtedly the most essential agent in a plating establishment. Yet how often is its proper condition ignored and no attention paid to the fact that it has done practically all the work that it will. The plater watches with extreme care the condition of his plating bath and allows the potash dip to take care of itself. The potash solution is just as fundamental, indeed, even more so, than the plating bath itself, for it is the first process in plating, and unless properly done further work avails nothing.

Work comes to the plater in all kinds of shape. Some is nearly free from grease, while others have considerable on the surface. That which comes from the machine shop is usually the worst, as every corner is smeared with thick grease or oil. Such work as this needs heroic treatment to remove this foreign matter, and the plater must be a man who uses judgment in such matters or he will not obtain good results.

For the removal of grease before plating there is no substance equal to potash. Caustic soda is much cheaper and is used to a considerable extent, but it is doubtful whether it is good policy to use it for this purpose. The principle of the removal of grease from metal work is based on the formation of a soda which becomes soluble in water. It is a well-known fact that caustic potash is the most powerful alkali and far surpasses caustic soda in this respect. Grease is not only more rapidly attacked, but the soap so formed is much more easily soluble in water than that produced from the action of caustic soda. It is the exemplification of the well known process of making soft soap from caustic potash and hard soap from soda. It is quite obvious that a soft soap is more readily dissolved by water than the hard variety.

The following facts may interest our readers as a demonstration of the wisdom of the above remarks. In one of the largest bicycle concerns which had previously used caustic soda because it was cheaper, it was found that a 3° Beaume solution of the best brand of potash obtainable would do the cleaning more thoroughly and quickly than a 20° Beaume solution of caustic soda. A stove maker states that he is now able, by using good caustic potash solution to clean his work in about five minutes with a 7° solution. Another feature of caustic potash is that much work needs no manual labor put on it in the cleaning bath such as scrubbing, while caustic soda will rarely clean work sufficiently without such labor being put upon it.

It is foolish to attempt to economize in the matter of potash, and the very best grade should be purchased. Little is saved in the price, and much is lost in the speed and results when cheap grades are purchased. It is certain that it is poor policy to use soda, and it is just as fundamental to the production of good work to use a good grade of potash as it is to purchase pure cyanide. The establishments which turn out the best quality of work are the most careful in details of this description.

Tellurium is the most dangerous impurity that can exist in copper, as it makes it crack during hot-rolling.

THE CORROSION OF CONDENSER TUBES.

The corrosion of condenser tubing is one of the most perplexing and mysterious problems with which the brass manufacturer and the shipbuilder and owner has to contend. It is quite natural that the difficulty should be laid at the door of the brass manufacturer, as it is the metal itself which gives the trouble, and the fact that in many instances the tubes have lasted many years tends to strengthen the belief in the user's mind that there is something radically wrong with the metal. The use of the purest metals in the manufacture of the tubing results in the same end. Change in composition usually leaves the matter as before. Tinning the tubes is a waste of time and money, while annealing does not materially change the results. The brass manufacturer firmly believes that there is some agency beyond the simple tendency towards corrosion that produces the evil effects, and when the dynamo and its resulting electric current began to be a factor on shipboard the tube makers cried *Eureka*, and said harsh words about the mariner who had dared to intimate that he did not know how to make good metal. The bad influence of the electric current was for a long time accepted as orthodox belief, but just at the present time there appears to be more or less skepticism in regard to such ideas.

The deterioration of condenser tubing seems to be giving fully as much trouble in the English marine as in our own, and A. W. Stewart, Esq., in a paper recently read before the Institution of Naval Architects of Great Britain, discusses the causes of such corrosion, and cites numerous experiments to strengthen his case. He says:

"The subject of corrosion in pipes has already been brought before you in an excellent paper by Professor Cohen, of Amsterdam, and the results of his investigations, supplemented by those of Mr. Yarrow, go to prove that sea water, co-operating with atmospheric air, is corrosive in its action on metal pipes. The corrosion is to some extent normal in its action, depending on the quality of the sea water and the nature of the metal employed, but many instances arise from time to time in which pipes deteriorate at quite abnormal rates, showing that other causes must have arisen to account for this rapid deterioration.

"Electric currents from the ship's dynamo are often blamed in accounting for these abnormal cases, and the investigations which I made in behalf of the Russian volunteer fleet, about a year ago, were carried out with the object of ascertaining if the dynamos on board their steamers were in any way responsible for the very rapid deterioration taking place in some of their pipes. The pipes in question had to be repaired or renewed at the end of every voyage, and the general opinion held by the engineers of the company was that the electric currents in the ship were the cause, and that some radical change would have to be made in the electric plant and cables in connection therewith."

Mr. Stewart carried out his experiments with the aid of electrical instruments, to detect any current which might have been present either from the galvanic action between the brass and the other metals or the stray currents which came from the dynamos. He was unable to detect any, and came to the conclusion that electricity on shipboard had nothing to do with condenser tube deterioration. To prove this, he cites instances in which the pipes were corroded when the dynamos had not been in operation for some time, and another in which there was no electric installation at all on board the vessel. He says in this connection: The continuous and mysterious corrosion of condenser tubes in steamers has perplexed the minds of their engineers to find a cause, and as something had to be blamed, the currents from the electric lights usually served the purpose. Many ships have been double wired throughout, to try and cure this trouble, but with no improvement; and in the course of my professional work several cases have been given me for investigation. One case which occurred will help to illustrate the many curious cases of corrosion.

"A Channel steamer, wired on the single wire system, and about one year old, suddenly gave trouble with her condenser tubes, most of the tubes being so bad as to require renewal. The engineer blamed the electric light, but on my explaining that this could hardly be the case, he blamed the manufacturer of the condenser tubes, who accepted the responsibility and supplied new tubes free of cost. It came to my knowledge that a paddle steamer, about twenty years old, whose condenser tubes had never given any trouble, suddenly developed a case of serious corrosion (no electric lights were on this steamer). On making inquiries it was ascertained that the two steamers had been moored together about six weeks previously in a certain part of a river not famed for its purity. Further inquiries elicited the fact that they were lying close to a main sewer pipe, which also served as a discharge from a galvanizing works, where many acids were used and discharged; hence the corrosion of the condenser tubes."

Carrying out his investigations Mr. Stewart came to the conclusion that the cause of the corrosion of condenser tubes, otherwise than the isolated case just mentioned, is the oil used on board the steamer. In England olive oil appears to be a favorite lubricant, and he finds that when strips of brass are immersed in pure olive oil that only a slight corrosion occurs. If, however, air is blown into the oil corrosion readily takes place. He thinks that the combined action of oil emulsified with air and salt water is the cause of the corrosion. Examination of the metal discloses nothing, as in every case he finds the quality excellent. As for the corrosion by electric currents, he states that such belief is entirely fallacious.

BRONZE FOR ART OR ORNAMENTAL WORK.

We have often been asked for a bronze mixture for sand casting which will cast well and possess the color and stiffness for use in art metal casting. We take pleasure, accordingly, in giving to our readers the proper mixture for this class of work:

Copper	90 lbs.
Tin	6 lbs.
Zinc	3 lbs.
Lead	1 lb.

This will give a mixture which casts remarkably well and runs free and thin. The slight amount of lead is sufficient to make the metal cut freely, but is not enough to effect the dipping of the castings. The tin is sufficient to render the metal free running and to give the proper hardness. At the same time it is not sufficient to cause much trouble from "sand burning." The 3 per cent. of zinc is enough to render the alloy sound, but does not cause any spelter smoke to produce bad spots. The alloy melts at a sufficiently low temperature to prevent the casting chilling before it has run up full.

As this alloy is only intended for the finest class of work it is essential that new metals be used, otherwise it is difficult to obtain the results. Only the best metals should be used. Melt the copper under charcoal and throw in a handful or two of common salt when the melting begins and stir it in. Then add the zinc and lastly

the tin and lead. Much of the success of this alloy, of course, depends on the molding.

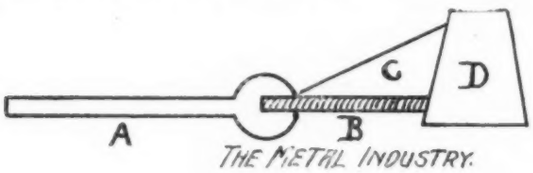
For art work, such as statuary, art goods and all other ornamental sand castings this mixture is excellent and is in use in one of the largest works in the United States which manufacture goods of this description.

ALUMINUM PATTERNS.

BY H. N. TUTTLE.

Aluminum appears to be coming into much favor for patterns, as it is light and does not crack or shrink like wood. It is also harder and will stand more hard usage than wood. One of the difficulties encountered is the soldering of the pattern to the gate, as no aluminum solder has yet been made which will solder satisfactorily. I overcome the difficulty of soldering the aluminum in the following manner:

A piece of sheet brass is cast into the pattern in its heaviest part and the brass then soldered onto the runner.

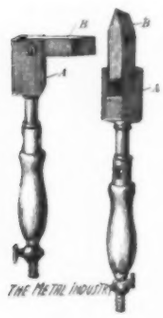


In the drawing, A represents the pattern, B the sheet brass cast into the pattern, C the brass or solder filling for cutting the gate and D the runner. The pattern should be over ⅛ in. thick to give good results by this process, as it is difficult to cast the brass into it if it is thinner.

Of course A, B, C could be cast entirely of aluminum and soldered onto an aluminum runner D, but I do not know of any solder which will solder brass to aluminum. An aluminum runner would hardly stand much rapping either, so I should think patterns of less than ⅛ in. in thickness had better be made of soft metal.

NEW GERMAN SOLDERING IRON.

An extremely practical gas soldering iron was recently placed upon the Berlin market. As is apparent from the illustration, the copper bit is movable and can be placed at any desired angle. By virtue of this construction the iron is of great convenience in soldering metallic edges so located as to be difficult of access. The heat generated by the gas flame (Bunsen burner) is utilized to its fullest extent in that the hollow part (A) prevents rapid radiation and concentrates the heat upon the copper bit (B). This system of heating develops a sufficiently high temperature to permit of the employment of a comparatively small piece of copper in the bit and also economizes in the amount of gas consumed. It is reported that a soldering iron of this kind which does the work of an ordinary soldering iron possessing a copper bit weighing 800 grams consumes but 102 liters of gas per hour, which, according to the prevailing price of gas in Berlin, represents a cost of from 3 to 5 cents per ten hours. The size of the flame can be regulated at will and the apparatus attached to any gas jet by means of a hose and operated without the employment of a bellows. The short length and comparatively light weight of the iron makes it a most convenient and handy tool to manipulate.



IMITATION GUN METAL FINISH.

BY J. W. FORCE.

The real gun metal finish is applied to steel and is quite difficult to produce satisfactorily. As this finish is both popular and pleasing, it is often desired to produce an imitation finish on iron, bars, copper or silver goods. Such a finish may be produced as follows:

The articles are given a coat of copper or silver in the usual cyanide bath and are then oxidized in a solution of liver of sulphur (potassium or sodium sulphide). This solution is made by dissolving 2 ounces of the liver of sulphur in 1 gallon of water.

This solution is used cold for copper and hot for silver. If the solution is too strong, the black produced will rub off. After the goods are oxidized they are rinsed in cold water and then in hot and afterwards dried in sawdust. They are next scratch-brushed on a fine jeweler's scratch-brush to a dead or matt finish and are then lacquered. Use no water on the scratch brush.

If a solution of chloride of platinum is used on silver, instead of the liver of sulphur, the finish produced is much finer.

A NOTE ON BURNISHING NICKEL PLATE.

In many instances nickel-plated goods may be burnished with far better results than those obtained by buffing. The coating put on may be very thin, and when burnished is extremely hard and durable. A method for burnishing nickel plate has already been published in THE METAL INDUSTRY, but several persons have informed us that, although they have followed the directions closely, the results were not satisfactory, as the surface could not be burnished bright.

In this connection it may be said that the difficulty lies in the use of the burnisher. The use of the customary steel burnisher, which gives good results on silver, is invariably attended with poor results, for the reason that the particles of nickel removed by the burnisher become magnetic and attach themselves to the face of the tool and so abrade the work. A good bloodstone burnisher should be used, and if the nickel-plating has been well done excellent results must follow.

ROYAL COPPER FINISH ON SOFT METALS.

The success of the Royal copper finish has led to a desire to produce it on britannia metal, zinc and other soft and low melting metals, but the heat necessary to produce the finish invariably results in melting the article.

A plater of long experience in the production of different finishes has suggested that an *imitation* finish of this nature may be produced on soft metals, as follows:

Plate the article in a cyanide copper bath which is very rich, so as to give a dark-matted deposit. The solution should also be strong in cyanide and have anodes of pure copper on all sides of the work to give an even deposit free from streaks. After rinsing, the mould should be dipped in alcohol and dried spontaneously, so as to avoid scratches or stains. Then dip in heavy gloss lacquer and the result will approach the real Royal copper finish.

The best results are always obtained in the use of babbitt metals by hammering down the metal after it has been cast into the box. In this manner not only is the metal forced into the grooves of the box, but is hardened as well. After being bored out, a perfect surface is produced. In this connection, however, it may be said that the lead alloys or so-called anti-friction metals are not well adapted for this, as they are too brittle. The tin, or genuine babbits are the ones to use for the purpose.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A brass founder has had difficulty in making small German silver castings. The castings are such that a high polish is required on them, but after this has been done the surface appears "frosty" in certain parts, and many blowholes or pinholes exist. He believes that the difficulty is in the sand and method of molding. The mixture which is used is: Copper, 50 per cent.; zinc, 25 per cent., and nickel, 25 per cent.

A.—The difficulty is not with the molding or sand, but in the mixture. It is impossible to make good sand castings of German silver of any percentage without the use of aluminum. Add 1 ounce of aluminum to every 100 pounds of German silver, and you will be surprised at the results. The castings will run much more free and at a lower temperature and without showing any indication of sluggishness. The castings will be free from pin holes and the "frosty" patches which you mention. Use a good brand of Lake Copper or electrolytic, if you want the best results. Keep out any lead as it makes the castings tarnish.

Q.—A plater asks if mercury can be solidified in any manner besides the process of amalgamating it with other metals.

A.—Mercury can only be solidified by freezing it at the temperature of 40 degrees below zero.

Q.—A melter asks a method for melting zinc borings and turnings. He has tried several different ways but without success.

A.—Zinc shavings or turnings cannot be melted in the usual manner by introducing into a crucible and heating nor can good results be obtained by melting in a kettle as in each case the majority of the metal oxidizes and wastes. The following method is one which we have used ourselves with excellent success, and we believe that by it the loss may be reduced to a minimum.

Melt a quantity of heavy zinc of some kind, such as a new slab spelter or heavy zinc, in an iron kettle, and have the heat slightly above the melting point. When this has been done proceed to stir in the zinc shavings until all has been introduced and taking care that the temperature does not become so low that the metal is chilled. By keeping the metal at a proper temperature the waste will be very small.

Q.—A hardware manufacturer wishes to know the percentage of magnesium that is used for hardening aluminum.

A.—It is customary to add from 3 to 5 per cent. of magnesium to aluminum for the purpose of hardening it. This will give alloys of the maximum hardness for ordinary requirements, but if a still harder alloy is required the amount of magnesium may be increased.

Q.—Plater wishes a remedy for spotting of iron castings after they have been plated.

A.—This difficulty is usually caused by the acid used during pickling geting into blowholes or other imperfections and gradually working out after the article has been plated. If you are much troubled it would be advisable to allow the castings to soak in lime water after they come from the pickle and have been rinsed. Of course, any acid dip may produce the same results, and if it is suspected that it comes from this, through absorption of acid by the spongy spots or holes, it is necessary to rinse very carefully and for some time in hot water before going to the plating bath. These spots are certainly quite perplexing, but we believe that they come almost exclusively from the absorption of acid in the manner which we have mentioned.

Q.—An attempt has been made by a subscriber to plane the surface of some zinc plates for the purpose of obtaining a smooth surface. He says that, no matter how fine a chip is taken off there are small pieces pulled out which leaves the zinc with the appearance of being full of blowholes. The addition of aluminum has been tried as well as a little copper, but the results were no better.

A.—The difficulty lies in the fact that spelter can not be planed with the ordinary planer and planer tool without such imperfections as you mention being produced. There is no elongation to the metal so it is torn and broken out of the surface, leaving the pits. If it is necessary to use a tool for cutting, a machine of the style of a brass plate overhauling machine, or scalper as it is often called, would do the work as the metal is sliced off and not dragged out. Grinding is also an excellent means for surfacing zinc, and if the proper kind of a wheel is used the results are good.

Q.—A founder asks how aluminum dross may be recovered.

A.—Only the metal in aluminum dross may be recovered, as the oxide can only be reduced in the electric furnace. To recover the metal melt in a crucible of good size with about a quart of common salt to the crucible. Add the salt after the temperature is at a low red and stir it in. Allow to remain in the fire for some time and remove the crucible, and skim off the fine dross and the metal may be run out. The metal obtained by this process, however, is of poor quality and should not be used except by adding in small amounts to other melts.

THE BRASS MANUFACTURERS.

The Brass Manufacturers of the United States held their annual meeting at Cleveland, Ohio, on December 8 at the Hotel Hollanden. The meeting was to have been held at Chicago, but was transferred by request to Cleveland. Commissioner William M. Webster reports that the meeting was a most satisfactory one, being well attended and several important business questions were talked over. Among them labor, credit and freight matters, and a committee was appointed to investigate the discrimination made by the Western railroads on freight rates of nickel-plated goods as against the regular brass finished or rough brass goods. The committee is to report at the next meeting, which is to be held at San Francisco. After the business session was over the members enjoyed a banquet at the Hollanden, at which forty-eight gentlemen were present.

FOUNDRYMEN AT ST. LOUIS.

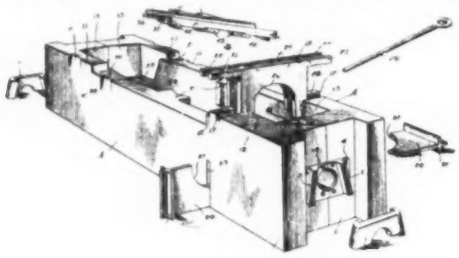
At a conference of the various foundry associations of the United States, held at the Manufacturers' Club, Philadelphia, in November, it was decided to submit to the foundrymen of the country a plan for a special foundrymen's building at the World's Fair, held at St. Louis in 1904. It is said that the great exhibition buildings of the Fair are already overcrowded to such an extent that it is impossible to obtain floor space for any collection of foundry exhibits, particularly for a "working foundry," and the various foundry associations believe that it would be a good plan to have a special foundry building at the Exposition.

Henry J. Bailey, founder of The Bailey-Farrell Manufacturing Company, of Pittsburg, Pa., died in Pittsburg on December 9 at the age of 65.

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

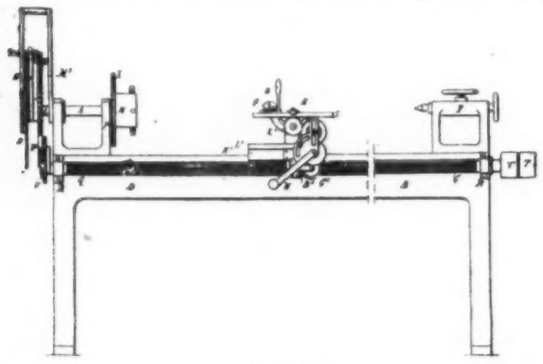
743,121, Nov. 3, 1903. APPARATUS FOR MAKING CORES.—William Weaver, Chicago, Ill., assignor to McCord & Company, Chicago, Ill., a corporation of New Jersey. An apparatus of the class specified, comprising a box having an open top and having its



743,121.

ends split vertically so as to permit horizontal separation of the sides of the box, the interior of the box being formed to give the core the desired configuration, and means for clamping the separable sides of the box temporarily together, substantially as described.

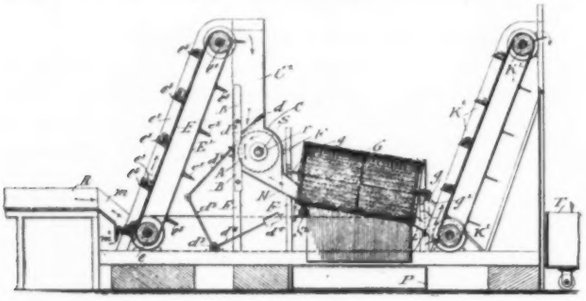
743,052, Nov. 3, 1903. ENGRAVING MACHINE.—Paul V. Avril, Ernest E. Marinier, and Eugene L. Navoit, Paris, France. In an apparatus of the character described, a dividing apparatus comprising a shaft, means for securing a cylinder to be engraved to the shaft, a disk C secured to the shaft and having uniform divisions, a disk D secured to the shaft and having a series of pins,



743,052.

a pivoted arm, a lug Q on said arm adapted to engage the pins, an arm loose on the shaft, a handle pivotally carried by the arm and adapted to engage with the divisions of disk C, a toothed wheel H carried by the shaft, a forked arm or block M^2 on the wheel H and an adjustable screw S^2 carried by the arm M^2, all arranged for co-operation as described.

744,572, Nov. 17, 1903. MACHINE FOR CUTTING UP TIN SCRAPS.—Max Lemberg, Sewaren, N. J., assignor to the Vulcan Detinning Company, New York, N. Y., a corporation of New Jersey. In a machine for cutting up tin scraps, the combination, with a gang of rotary saws, a casing for the same open at its upper and lower



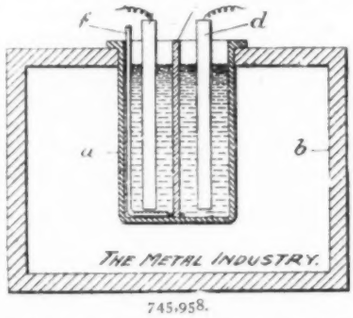
744,572.

ends, a conveying-trunk vertically above and connected with the open upper end of the casing, and a discharge-chute at the lower open end of the casing, of slots in said vertical trunk in proximity to and above the saws, and means movable in said slots for holding the bulky articles in position for the cutting-up action of the saws, substantially as set forth.

744,170, Nov. 17, 1903. PROCESS OF DEPOSITING METALLIC COATINGS ON METALLIC OBJECTS.—André Darlay, Paris, France. A process for depositing metallic coatings on metallic objects, consisting in bringing the objects to be plated into contact with metallic aluminium in an alkalne bath containing a double salt of an alkali metal and of the metal to be deposited, a great excess of phosphate of an alkali, and a carbonate of an alkali, substantially as set forth.

744,467, Nov. 17, 1903. WIRE COVER.—Hugh C. Boyle and John Maum, Elizabeth, N. J. A cover for wire coils comprising a circular strip of flexible material bent upon itself to form a tubular casing, straps secured to the ends of the casing for binding them upon the coil of wire, eyes formed within the strip adjacent the edges thereof, and a flexible strip projecting through the eyes and under the edges of the strip alternately, whereby said edges may be bound together and the strip securely fastened about the coil of wire.

745,958, Dec. 1, 1903. MANUFACTURE OF SODIUM.—Thomas Ewan, Glasgow, Scotland, assignor to the Cassell Gold Extracting Company, Limited, Maryhill, Glasgow, Scotland. The improved process for manufacturing sodium, which consists in sub-



745,958.

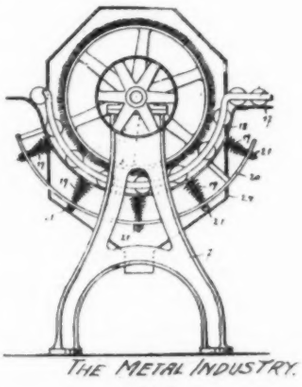
jecting fused sodium hydroxid to the action of the electric current and separating the metal produced at the cathode from the water and anodic oxygen produced at the anode by a porous diaphragm, the main constituent of which is alumina (Al_2O_2).

745,678, Dec. 1, 1903. MOLDER'S TOOL.—Louis A. Schulze, San Francisco. A molder's tool provided with a projecting stem, a handle adapted to engage said stem, and a spring on said stem adapted to engage and project through a slot in said handle and

745,678.

prevent accidental displacement of said tool relative to said handle and a transverse pin in said handle adapted to engage said stem and prevent independent twisting thereof for the purpose set forth.

746,108, Dec. 8, 1903. SOLDER-SAVING MACHINE.—Worth D. Kyser, Frankfort, and Jasper C. Morgan, Mohawk, N. Y.—The combination in a solder-wiping machine of a carrier-wheel, a track substantially conforming to a portion of the circumference



746,108.

of the carrier-wheel, a brushing-wheel arranged at the side of the carrier-wheel and with its brush of somewhat larger diameter and means for driving the carrier-wheel and brushes, respectively.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

The Troy Nickel Works, Albany, N. Y., are issuing an attractive memorandum book for 1904.

The Hudson Rolling Mill Company, of Bloomfield, N. J., expect to enlarge their mill in the spring.

The Simon Brass Foundry Company, of Lansing, Mich., have been incorporated with a capital of $6,000.

The equipment has been secured for the new foundry of the Ludlow Valve Manufacturing Company, of Troy, N. Y.

A new office and storehouse is being erected at Causeway and Beverely streets, Boston, to be occupied by the American Glue Company.

The roof is being placed on the new factory of The Barcalo Manufacturing Company, Buffalo, N. Y., makers of brass and iron bedsteads.

The New York Aluminum Company have moved their factory to Newark, N. J. They still maintain a salesroom at 377 Broadway, New York.

Owing to a steady growth of their business, the capital stock of the Turner Brass Works, Chicago, Ill., has been increased from $15,000 to $150,000.

The Omega Steel Company, of New Haven, Conn., say that nothing has yet been done about the starting of their new plant in Pennsylvania.

F. L. Harding, a technical electro-metallurgical chemist, of Newark, N. J., makes a specialty of dipping and plating, lacquers, varnishes, analyses, waste.

Samuel Butter & Co., of Boston, Mass., are going out of the retail metal business, and will in the spring start a smelting works at South Braintree, Mass.

Joseph Murphy, electro-plater, of Montreal, Canada, has begun to manufacture aluminum combs. It is reported that there is a ready market for these combs in Montreal.

Two metal firms, which make a specialty of buying scrap aluminum, are The Fort Wayne Smelting & Refining Works, of Fort Wayne, Ind., and Lehman Brothers, Hoboken, N. J.

The Harrisburg Pipe & Pipe Bending Company, Harrisburg, Pa., make a specialty of coils and coil work, making their own iron pipe and buying their brass tubing from other mills.

The Coe Brass Company, of Torrington, Conn., has purchased 4,000 acres of timber land on Bolton Mountain, near Bolton Station, Vt. The wood on this land will be used for annealing.

The L. C. Smith & Brothers Typewriter Company, of Syracuse, N. Y., are occupying their large new building, at 701 East Washington street. The company make visible typewriters of a new design.

The Vulcan Copper Works Company, of Cincinnati, O., have been incorporated, with a capital of $25,000, by C. H. Kratz, Otto Dischager, John A. Fleming, H. O. Wente and E. H. Wente.

The Aluminum Manufacturing Company, of Two Rivers, Wis., report that their business for 1903 showed an increase over that of 1902. Every year they put out a larger variety of aluminum goods.

The American Silver Company, of Bristol, Conn., who heretofore have confined their operations to plated goods, will shortly commence the manufacture of sterling silver flat and hollow ware.

The firm of Wunderlich & Motzer, brass and iron founders, of Lebanon, Pa., has been dissolved, and the business will be carried on by Fred. Wunderlich. The firm manufactures a variety of brass castings.

The Barlow Manufacturing Company, Holyoke, Mass., manufacturers of store fixtures and advertising specialties, have taken additional room, which will add 50 per cent. to the capacity of their establishment.

The Never-Tarnish Manufacturing Company, of DuBois, Pa., have arranged recently to make door plates and coffin plates of aluminum. They make a variety of specialties in aluminum and turn out work for other parties.

J. H. Gautier & Co., of Jersey City, N. J., who have manufactured crucibles for nearly fifty years, have decided to enlarge their plant. The addition will include a new power house and a four-story brick factory building.

The Humphryes Manufacturing Company, of Mansfield, O., makers of plumbers' brass goods, have arranged with the Mitchell & Van Meter Company, 247 Centre street, New York, to represent them in the Eastern territory.

Oberlin Smith has been elected president of the Ferracute Machine Company, Bridgeton, N. J., and Enos Paullin, secretary and treasurer. The company will build a large plant near the site of their old works, which were destroyed by fire.

The International Aluminum Company, of Buffalo, N. Y., have been incorporated, with a capital of $10,000, by A. A. Fennyvessy, C. A. Nelson and William H. Drum, for the purpose of manufacturing and dealing in all kinds of aluminum goods.

The sheet rolling mill of the Tamerack-Osceola Manufacturing Company, at Dollay Bay, Mich., has been sold to the Association of Brass Manufacturers of the United States. The plant will be entirely dismantled and the machinery shipped East.

The Standard Sanitary Manufacturing Company, of Pittsburg, Pa., report a large export business to the leading countries of the world. They have a London branch, where they carry an extensive stock for the English and colonial markets.

The former copartnership of the Faunt Brothers, of Chicago, have been incorporated, with the following officers: R. C. Faunt, president and treasurer; George N. Hewett, secretary; Robert Faunt, manager. The company will manufacture brass castings.

The Sessions Clock Company, of Forestville, Conn., formerly the E. N. Welch Manufacturing Co., are now installed in their new buildings. These buildings will be devoted to the manufacture of marbleized clocks, for which twenty ovens have been built.

The Syracuse Smelting Works are building a plant at Montreal, Canada, to produce ingot copper. They will smelt both scrap and ore, and expect to have their plant running about February 1. They will sell metal to both American and Canadian consumers.

The Spencer Wire Company, of Worcester and Palmer, Mass., is about to work up the by-products of their mill into colors and dye-stuffs. The Worcester Color Company has been formed for this purpose, and all kinds of Prussian blue and similar chemicals will be manufactured.

The business of Wilkoff Brothers, Youngstown, O., has been turned over to a corporation, with the title of The Wilkoff Brothers Company, organized with a capital stock of $100,000. The management will be the same as in the past, and the company will manufacture metal products.

The plant of the Lancaster Silver Plate Company, Lancaster, Pa., was recently totally destroyed by fire. The company are at present located in temporary quarters, and are in operation with about half their regular force. They will rebuild and hope to get into their new building by April 1, 1904.

The business of The Bristol Brass Company, formerly the Bristol Brass & Clock Company, has expanded to such an extent that the directors have voted to increase the capital stock from $400,000 to $500,000. This will give them additional capital. No plant enlargement is contemplated.

A brass foundry for the manufacture of plumbers' supplies has been started by Jas. P. J. Cahill at Worcester, Mass. The building is finished and all the equipment in, and the first heat will shortly be taken out. In addition to the manufacture of plumbers' goods, jobbing will be undertaken.

H. F. Neumeyer, of Macungie, Pa., announces that he has taken a new partner into his business and changed the name of his firm to the Macungie Brass & Manufacturing Company. The company will have a new factory and a foundry, where they will be prepared to make castings in copper and bronze.

The Yale & Towne Manufacturing Company, of 9 Murray street, New York, have issued a folder entitled "Three Labor Savers," showing their three types of chain blocks. These blocks are known, respectively, as Duplex and Triplex, and Differential, and are made of capacities from ½ ton to 20 tons.

Owing to the effects of natural gas fumes on silverware, The Anchor Silver Plate Company are moving their factory from Muncie, Ind., to St. Paul, Minn. The company have been in business for eleven years, and have been re-organized recently as a Minnesota corporation, with a capital of $150,000.

The Henry McShane Manufacturing Company, of Baltimore, Md., one of the largest manufacturers of bells in the United States, have gone into the hands of a receiver. The works were founded by Henry McShane some fifty years ago. The company also manufacture, in addition to bells, a line of brass goods.

In addition to our Directory of Brass and Copper Rolling Mills from the advertisers in which our readers can obtain ingot, sheet, rod, wire and tubing, we start in this issue a Directory of Lead and Zinc Smelters and Manufacturers from the advertisers in which our readers can obtain lead, zinc, spelter and acids.

The New Era Manufacturing Company, of Kalamazoo, Mich., is sending out a set of formulas for the manufacture of bronzes by the use of their alloy, *Metallic Phosphoro*. This is drawn up in a useful style, comparing their formulas with those in ordinary use. This pamphlet should prove of interest to foundry men.

The Cowles Electric Smelting & Aluminum Company, of Lockport, N. Y., sell aluminum in the form of ingots, sheets, rods and wire at market prices. They make a specialty of several aluminum alloys for brass founders. They are also producers of silicon copper, aluminum bronze, silver bronze and make to order special alloys.

The Manitowoc Aluminum Novelty Company, of Manitowoc, Wis., have put in a 600-ton toggle press, and expect to do more work in the embossing line. The company's employees now number 125 men, which is double the number of two years ago. The company are well satisfied with the past year's business and report the outlook good for 1904.

The Turner-Armstrong Brass Company, Port Washington, Wis., have been re-organized under new management and changed their title to the Wisconsin Brass Company. W. J. Turner is president of the new concern, and W. H. McReynolds, secretary, and the company will continue the manufacture of plumbers' and steamfitters' supplies.

The Standard Automobile Company, of East Liberty, Pittsburg, Pa., have been incorporated with a capital of $75,000. The officers are: W. N. Murray, president; Robert Pitcairn, vice-president; Robert R. Gordon, secretary and treasurer. The company will take over the business of the Seeley Manufacturing Company, also builders of automobiles.

Silverman Brothers Iron & Metal Company, of Grand Rapids, Mich., have bought property at the corner of Dewey street and the Pere Marquette Railroad tracks, 120x165 feet. During the winter the land will be used as a storage yard, but in the spring the purchasers intend to erect a warehouse and office building and make the new site their headquarters.

The Hill & Griffith Company, of Cincinnati, O., manufacturers of foundry facings and supplies, have moved into their new factory building, located near the site of their old one. The new building is said to be one of the largest in the country devoted to the manufacture of foundry supplies, and the company are now better prepared than ever to take care of their trade.

The Loomis-Pettibone Gas Machinery Company and The Holthoff Machinery Company have been merged into the name of the Power & Mining Machinery Company. The line of gas producers of the Loomis-Pettibone Company will still be manufactured, and in addition the Crossley gas engine. The main office of the company will be at 52 William street, New York.

The firm of Richards & Co., Boston, Mass., who have sold metal since the year 1812, report that they did a better business in 1903 than in 1902, and look for a good business during 1904. They believe the outlook is good, at any rate for the first six months in 1904. Richards & Co. make a specialty of metals used by the brass founder, particularly the New England brass founders.

The old plant of the Fairfax Company, Marietta, O., has been taken over by The Standard Supply Company, of the same place. The plant is being overhauled for the manufacture of foundry facings and supplies, and is expected to be ready for operation by January 15. The officers are: A. L. Gracey, president; O. B. Gard, vice-president; O. L. Gard, secretary, and Wirt S. Oye, treasurer and general manager.

At the end of the year of 1902 The McKenna Brothers Brass Company, of Pittsburg, Pa., divided $6,000 among their employees, this amount being 10 per cent. of the company's earnings. Ten per cent. of the company's profits for the year 1903 will also be shared with their workmen, and it is expected to be a larger sum than that of 1902. Several large contracts have been executed by the company during the past year.

The Welsh-Loftus Uranium & Rare Minerals Company has begun the erection of a plant at Buffalo, N. Y., for the manufacture of radium. The ores to be used would be called a copper ore, although the uranium and copper content, together, are hardly in what would be called paying quantities. The ore is obtained from mines at Richardson, Grand county, Utah. The present capacity of the plant is to be 1 ton of ore per day, and the radium will be disposed of to the medical profession. The manager of this plant is Stephen T. Lockwood.

The Roberts Chemical Company, of Niagara Falls, N. Y., are now putting on the market a grade of caustic potash made especially for the plating trade. Heretofore it has been considered that anything was good enough for the plating shop, but this company look at it differently, and believe that the best is none too good. They are furnishing many of the leading plating establishments with their caustic potash, and it is surprising how quickly and thoroughly it will clean work for plating. The potash is sold in liquid form, or may be obtained in drums of 100, 200 or 800 pounds.

Metal Prices, January 5, 1904

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malaca	29.25
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	12.85
Electrolytic	12.75
Casting	12.50
SPELTER—Duty 1c. per lb.	
Western	5.00
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.30
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	7.00
Halletts	6.25
Other	6.25
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 60
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.58
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask	47.50

Sheet Lead, 7¾c. per lb., 20 per cent. off.
Lead Pipe, 6¾c. per lb., 20 per cent. off.
Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 7.50c. per lb., open, 8c. per lb.
Tobin Bronze—Rods, Unfinished, 19c.
Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	10.50c.	12.00c.
Copper Wire	10.00c.	11.50c.
Light Copper	9.50c.	10.00c.
Heavy Mach. Comp	9.50c.	10.50c.
Heavy Brass	7.00c.	8.00c.
Light Brass	5.50c.	6.25c.
No. 1 Yellow Brass Turnings	6.50c.	7.25c.
No. 1 Comp. Turnings	8.25c.	9.00c.
Heavy Lead	3.85c.	4.10c.
Zinc scrap	3.75c.	4.00c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12¼ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, January 5, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb.	23c.
Lighter than 10 oz.	24c.
10 oz. and up to 12 oz.	26c.
12 oz. and up to 14 oz. to square foot, per lb.	29c.

Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24¼	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.31
Above No. 10 to No. 16..	.23½	.27½	.31½
Nos. 17 and 18.....	.24	.28	.32
" 19 and 20.....	.25	.29	.33
No. 21.	.26	.30	.34
" 22.....	.27	.31	.35
" 23.....	.28	.32	.36
" 24.....	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING

From 2 in. to 3¼ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	33	23	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

Plain	Round	Tube.								Per lb
"	"	"	⅜	in.	up	to	2	in.,	to No. 19, inc.	$0 35
"	"	"	7/16	"	"		2½	"	" "	36
"	"	"	½	"	"		2½	"	" "	38
"	"	"	9/16	"	"		2½	"	" "	41
"	"	"	⅝	"	"		2½	"	" "	48
"	"	"	¾	"	"		2½	"	" "	65
"	"	"	⅞	"	"		2½	"	" "	1 06
"	"	"	1	"	"		2½	"	" "	1 50

Smaller than ¼ inch.....Special
2 inch to 3 inch, to No. 19, inclusive 38
3 inch..... 40
Over 3 inch to 3½ inch..... 45
Over 3½ inch..... 50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than.. And Including	Polishing One Side.	Bare Finish, with-out Lacquer, One Side.	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	44	50	57	66	Polished two sides double above prices.	Bare Finish two sides double above prices.
No. 13 & heavier.	2	2	55	55	55	55	55	51	.....																				
14 15	2	2	60	60	60	60	58	55	.....																				
15 16	2	2	60	60	60	60	58	55	.....																				
16 17	2	2	60	60	60	60	58	55	.....																				
17 18	2	2	60	60	60	60	58	55	.....																				
18 19	2	2	60	60	60	60	58	55	.....																				
19 20	2	2	60	60	60	60	58	55	.....																				
20 21	2	2	60	60	60	60	58	55	.....																				
21 22	2	2	60	60	60	60	58	55	.....																				
22 23	2	2	60	60	60	60	58	55	.....																				
23 24	2	2	60	60	60	60	58	55	.....																				
24 25	2	2	60	60	60	60	58	55	.....																				
25 26	2	2	60	60	60	60	58	55	.....																				
26 27	2	2	60	60	60	60	58	55	.....																				
27 28	2	2	60	60	60	60	58	55	.....																				
28 29	2	2	60	60	60	60	58	55	.....																				
29 30	2	2	60	60	60	60	58	55	.....																				
30 31	2	2	60	60	60	60	58	55	.....																				
31 32	2	2	60	60	60	60	58	55	.....																				
32 33	2	2	60	60	60	60	58	55	.....																				
33 34	2	2	60	60	60	60	58	55	.....																				
34 35	2	2	60	60	60	60	58	55	.....																				
35 & 36	2	2	60	60	60	60	58	55	.....																				
37 & 38	2	2	60	60	60	60	58	55	.....																				
39 & 40	2	2	60	60	60	60	58	55	.....																				
.008" to .0015"	2	2	60	60	60	60	58	55	.....																				
Less than .0015"	2	2	60	60	60	60	58	55	.....																				
Not wider than 6 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
6 in. 14 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
14 in. 16 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
16 in. 18 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
18 in. 20 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
20 in. 24 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
24 in. 30 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
30 in. 36 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
36 in. 40 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
40 in. 45 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
45 in. 50 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
50 in. 55 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8
55 in. 60 in.	2	2	60	60	60	60	58	55	51	47	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in. All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds				10	per cent. off list.
1,000 to 2,000	"	10	per cent. and	2	" "
2,000 to 4,000	"	10	" "	3	" "
4,000 pounds and over		10	" "	5	" "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4	.....	.....	.....	10	9	8	7	1-4
5-16	.....	.....	.....	11	9	8	7	5-16
3 8	.....	.....	.....	12	9	8	7	3 8
1-2	.....	.....	17	14	11	9	8	1 2
5-8	.....	.....	21	16	13	12	.....	5-8
3-4	.....	.....	25	19	16	14	.....	3-4
7-8	.....	.....	28	22	18	16	.....	7-8
1	.....	.....	30	25	21	19	.....	1 00
1 1-4	.....	.....	36	30	25	.....	.....	1 1-4
1 1-2	.....	52	43	35	28	.....	.....	1 1-2
1 3-4	.....	60	50	41	33	.....	.....	1 3-4
2	84	68	58	47	37	.....	.....	2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B. & S. Gauge.	0000 to No. 10	No. 11	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.

30,000 lbs. and over, four cents off list.

All columns except the first are for Flat Rolled Sheets.

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or